NASA SBIR/STTR Technologies

S1.06-9362 – Lightweight Superconducting Magnets for Low Temperature Magnetic Coolers

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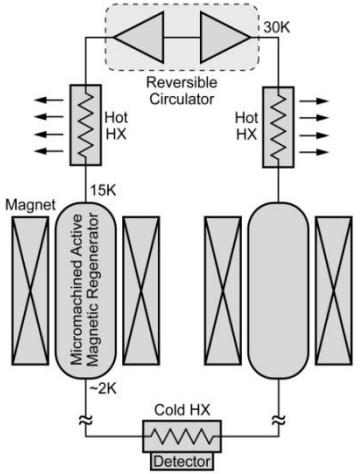
Identification and Significance of Innovation

- A lightweight, reliable, efficient Active Magnetic Regenerative Refrigeration (AMRR) system for space applications
  - Cooling temperatures in the range of 2 K
- Ability to provide remote/distributed cooling
- Propose to develop an advanced high-temperature, lightweight superconducting magnet
  - High field; low current
- An optimum time-varying field profile for efficient AMRR operation

TRL 3 at start of Phase II, TRL 4 at end of Phase II

- Technologies for the reversible cryogenic circulator have been developed.
- Regenerator technologies are being developed. Key milestones have been achieved.
- Here, we propose to fabricate a lightweight superconducting magnet and demonstrate a brassboard AMRR system.
- In Phase III, we will build a complete AMRR system.



Technical Objectives

- A lightweight, robust superconducting magnet with low parasitic losses
- High heat rejection temperature
- High AMRR system thermal efficiency

Work Plan

- Fabricate and qualify superconducting magnet
- Magnet integration design
- Assemble brassboard AMRR system with circulator, regenerator, and superconducting magnet
- Characterize brassboard AMRR system performance

NASA and Non-NASA Applications

- Cooling systems for cryogenic detectors for sensing X ray, infrared, and sub-millimeter radiation (bolometers and microcalorimeters)
- Lightweight, low-current, high field superconducting magnets for science instruments
- Cooling systems for superconducting digital electronics, superconducting RF cavity for accelerators, and MRIs

Firm Contacts

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